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PATENT SPECIFICATION

NO DRAWINGS

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COMPLETE SPECIFICATION

Improvements in or relating to Reflective Markers for Highways and the like

We, PRISMO SAFETY CORPORATION, a Corporation organised under the laws of the State of Pennsylvania, United States of America, of 301 Penn Street, Huntingdon, Pennsylvania, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to reflective markings and more particularly to a reflective highway marker and the composition therefor which dries almost immediately upon deposition.

Heretofore reflective road markers in the form of traffic paint have been applied by either of two methods. The first method involved the cold deposition of an essentially three-component system comprising solvent, binder and pigment. The traffic marker line is hardened by the evaporation of the solvent and after most of the solvent has evaporated, the consistency of the remaining binder and pigment is sufficiently high so that traffic can pass over with little or no deformation or smearing of the line. The cold spraying method requires a high proportion of solvent in the neighborhood of 50% by volume to ensure proper spraying viscosity. This method suffers from the disadvantage of using large quantities of solvent and resulting in slow drying. The second method involved the use of similar materials but applied the materials in a hot spray in the neighborhood of 160° F. This method has the advantage that the use of heat reduced the viscosity of the material and thus required the use of less solvent and yielded a faster drying time, but still suffers from the disadvantage that the drying time has not been reduced below about 15 minutes for a 15 mil line thickness. In both cases the material is sprayed by the use of air pressure and the solvents used are the conventional relatively high boiling point solvents normally used in paints applied by road machinery.

It is therefore an object of the present invention to provide a line marking method and composition which enables traffic to pass over the sprayed lines almost immediately without pick-up, deformation or smearing of the lines.

According to the present invention a method of applying a traffic line marker onto a roadway which comprises: forming a paint composition by mixing pigment, a binder, a first solvent for said binder having a relatively high boiling point, and a second solvent having a relatively low boiling point, the proportion of low boiling solvent to high boiling solvent being between 1 to 1 and 5 to 1, and spraying the composition under pressure at an elevated temperature, said spraying temperature being above the boiling point of said low boiling solvent and below the boiling point of said high boiling solvent.

The composition, ranging in proportions from as much as 10—30% binder, 14—40% solvent and 45—70% pigment, filler, or glass, is mixed into a thin, viscous paste and placed into a closed spraying device. When ready for spraying, the contents of the spraying device are heated to a temperature above the boiling point of the relatively low-boiling solvent. For the preferred solvents, a mixture of methylene chloride and naphtha, the preferred spraying temperature is 160° F. However, the temperature can be varied as desired depending on the low boiling solvent used.

As the temperature of the composition is increased, (1) the viscosity of the paste becomes greatly reduced due to the increased temperature of the components and (2) part of the low boiling solvent produces a vapor pressure within the spraying device. Upon reaching the desired temperature, the spray nozzle is opened and pressure from the volatilized solvent forces the composition out through the nozzle similarly to an aerosol spray.

Because the composition upon leaving the nozzle is at an elevated temperature, the majority of the remaining low boiling solvent is evaporated between the nozzle and the road. Also during travel of the spray from the nozzle to the road, the composition is cooled by the surrounding air and also by loss of heat of vaporization due to the evaporating solvent. These factors, as well as the effect of the cool road, causes the viscosity of the composition to increase to such an extent that it is dry to the touch within one minute after deposition. The combination of this drying and increase of viscosity, along with conventional surface skinning due to evaporation of the higher-boiling solvent, prevents any pick up by traffic.

The materials used in the composition and proportions are subject to wide variation. It is essential, however, that the boiling point of the low-boiling solvent in the mixture be below the elevated spraying temperature, that the high boiling solvent have a boiling temperature above the spraying temperature, and that the proportion of low boiling solvent to high boiling solvent be between 1 to 1 and 5 to 1. By having too much low boiling solvent or a solvent boiling at too low a temperature the pressure in the spraying device will become excessive and the composition will dry during spraying and before deposition; by having too much high boiling solvent, on the other hand, there will be insufficient spraying pressure and the road line deposit will take too long to dry. The high boiling solvent thus serves as a drying retardant.

The exact proportion of high boiling solvent to low boiling solvent will depend upon the spraying temperature, the boiling points of the two solvents and the total proportion of solvent used in the composition. For naphtha and methylene chloride, for example, the preferred ratio range is from 1 part by weight of methylene chloride to 1—5 parts by weight of naphtha.

The lower boiling solvent should preferably be non-flammable, be a solvent for the resin used and boil between 100—200° F. The ideal operating range is between 160—170° F.

The higher boiling solvent should be a solvent for the alkyd resin and should boil above 200° F.

Although the preferred solvent system has been disclosed as methylene chloride as the lower boiling solvent and naphtha as the higher boiling solvent, many other combinations will work very well.

As the lower boiling solvent, chlorinated hydrocarbons have been found to be ideal mainly because of their non-flammability and high solvency. Among the chlorinated hydrocarbons which can be used are methylene chloride, carbon tetrachloride, trichloroethylene, trichloroethane, and perchloroethylene. The latter three are usually mixed with a lower boiling material to lower the boiling point to within the desired range. It should be noted that the chlorinated hydrocarbons such as carbon tetrachloride, trichloroethylene and perchloroethylene are highly toxic upon inhalation and when these materials are utilized in the composition, it should be used with proper precautions to prevent damage to the user thereof.

The higher boiling solvents may include naphtha, oxylol, and others which are both solvents for the alkyd resins and boil above 200° F.

The binder may be any suitable resin which becomes hardened when the solvent has evaporated. Examples of such binders are alkyd resins, vinyl resins, and one component epoxy resins.

The preferred range of materials used and the preferred embodiment are shown in the chart below in % by weight. Specific examples of the composition follow the chart.

Material	Preferred Range	Preferred Embodiment
Binder	15—25%	18%
Solvent	15—25%	17%
Remainder (e.g. pigment) (extender, glass)	60—70%	65%

It has also been found that it is desirable to have a combined resin-solvent volume concentration of about 43—44%.

EXAMPLE 1

Material	lbs.
Pigment (Titanox (Registered Trade Mark) RCHT—X)	450
Extender (Silica, 5 micron)	350
Extender (Asbestime 3X)	60
Medium oil alkyd binder 30% phthalic anhydride and 70% soya oil (60% solids in naphtha (Beckosol (Registered Trade Mark) P—650)	400
Methylene Chloride	85
Cobalt drier	1.75
Lead drier	3.50
Blue dye	1 oz.

EXAMPLE 2

Material	Parts by Weight
Chrome yellow medium (pigment)	200
Titanox (Registered Trade Mark) RCHT—X (pigment)	200
Silica, 5 microns (extender)	400
Asbestime 3X (extender)	50
Beckosol (Registered Trade Mark) P—650—60% solids in V.M. & P. naphtha	400
Methylene chloride	50
Cobalt drier	1.75
Lead drier	3.50

EXAMPLE 3

Material	Parts by Weight
Pigment	250
Glass beads	350
Extender	200
Fast drying alkyd binder 60% solids in naphtha	400
Methylene chloride	90
Driers	5

After the composition in accordance with the previous examples has been sprayed onto the roadway, glass beads can be immediately dropped onto the paint while it is still tacky so that the beads become partially embedded in the paint and yields a line that is immediately retroflective. The higher boiling solvent retards the setting up of the paint until it has reached the road and the glass beads have been dropped on.

The following examples show a variation of the invention which includes the low boiling solvent, the high boiling solvent, the binder (e.g. a fast drying alkyd resin) which is soluble in both solvents, the pigment, extenders, and a second binder (e.g. a copolymer of polyvinyl chloride and polyvinyl isobutyl ether) which is soluble in the low boiling solvent of the mixture, but insoluble in the higher boiling component of the solvent mixture.

EXAMPLE 4

Material	Parts by Weight
Pigment (Titanox (Registered Trade Mark) R.A. and zinc oxide)	200
Extender or filler (Celite 281 and Surfex) (Registered Trade Mark)	550
Medium oil alkyd binder 30% phthalic anhydride and 70% soya oil (Beckosol (Registered Trade Mark) P—650)	240
Naphtha	160
Copolymer of vinyl chloride and vinyl isobutylether (Vinoflex (Registered Trade Mark) MP—400)	30
Methylene chloride	100
Surface active agent (Duomeen (Registered Trade Mark) T.D.O.)	5
Cobalt drier	2
Lead drier	4

The medium oil alkyd binder is dissolved in the naphtha and this in turn is mixed with the methylene chloride and vinyl copolymer. The proportions are so chosen that the copolymer is just soluble in the combination of methylene chloride and naphtha. As the material is sprayed at elevated temperature the methylene chloride is evaporated, thus causing the copolymer to become insoluble. Most of the methylene chloride is lost before and immediately after deposition on the road surface. This leaves some solvent in the film, but this is mostly naphtha in which the copolymer is insoluble with the result that the composition immediately upon striking the road surface has a sufficiently high consistency, along with some surface skinning, to prevent any pick-up by traffic.

EXAMPLE 5

Material	Parts by Weight
Pigment	450
Glass beads	300
Extender	100
Alkyd binder	200
Naphtha	160
Vinyl chloride-vinyl isobutyl ether copolymer	35
Trichloroethane	100

EXAMPLE 6

Material	Parts by Weight
Titanium dioxide	300
Crushed glass	265
Glass beads	135
Calcium carbonate (Extender)	125
Phthalic alkyd binder	200
Naphtha	160
Vinyl chloride-vinyl isobutyl ether copolymer	90
Methylene chloride	150
Driers (24% lead and 6% cobalt)	2

Traffic can pass over the lines of the present invention within 1 to 2 minutes of being sprayed without any smearing or deformation of the lines. This differs from the prior system due to the fact that in the prior systems as long as even fairly small percentages of solvent are retained the consistency of the film deposited is not stiff enough to let traffic pass over, even though the surface is dry to touch due to so-called skinning over. It is exactly the skinning over effect that traps solvent in the film and prevents any further reduction in drying time regardless of decreased solvent content and increased temperature. This is not true in the present invention which evaporates solvent before deposition and in which the binder has a high consistency during deposition.

Any fast drying alkyd resin can be used in the present process as the binder. The preferred solvent system comprises a mixture of methylene chloride and naphtha.

It will be obvious to those skilled in the art that various changes may be made without departing from the scope of the invention and therefore the invention is not limited to what is shown and described in the specification, but only as defined in the appended claims.

WHAT WE CLAIM IS:—

1. A method of applying a traffic line marker onto a roadway comprising: forming a paint composition by mixing pigment, a binder, a first solvent for said binder having a relatively high boiling point, and a second solvent having a relatively low boiling point, the proportion of low boiling solvent to high boiling solvent being between 1 to 1 and 5 to 1, and spraying the composition under pressure at an elevated temperature, said spraying temperature being above the boiling point of said low boiling solvent and below the boiling point of said high boiling solvent.

2. A method in accordance with claim 1

wherein said spraying temperature is approximately 160° F.

3. A method in accordance with claims 1 and 2 wherein said low boiling solvent is methylene chloride.

4. A method in accordance with claims 1—3 wherein said low boiling solvent boils between 100—200° F.

5. A method in accordance with claims 1—4 wherein said high boiling solvent is naphtha.

6. A method in accordance with claim 1 wherein said low boiling solvent boils between 160—170° F and said high boiling solvent boils above 200° F.

7. A method in accordance with claims 1—6 wherein said paint composition comprises 10—30% resin binder, 45—70% pigment and 15—40% of said solvents.

8. A method in accordance with claims 1—7 wherein said low boiling solvent includes a chlorinated hydrocarbon and boils between 100—200° F.

9. A method in accordance with the preceding claims wherein said low boiling solvent is methylene chloride, said resin binder is an alkyd resin, the ratio of high boiling solvent to methylene chloride lies between 1:1 and 5:1, and the spray temperature is about 160° F.

10. A method in accordance with claim 9 wherein a second resin binder which is a copolymer of vinyl chloride and vinyl isobutyl ether is mixed into said paint composition, and the ratio of said low boiling solvent to said second resin binder is between approximately 10:3 and 10:3.5.

11. A method of applying a traffic line marker onto a roadway substantially as herein described.

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